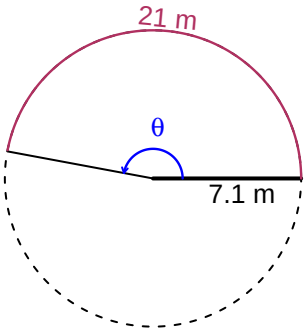
Name: Date:

Trig Final (Solution v22)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 21 meters. The radius is 7.1 meters. What is the angle measure in radians?

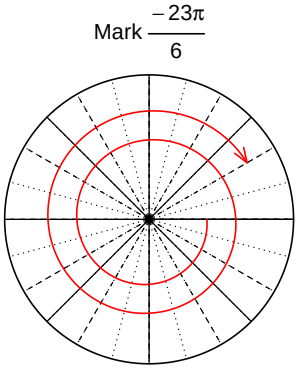


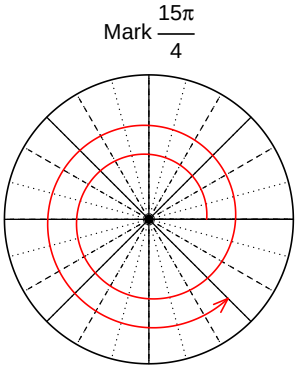
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 2.958$ radians.

Question 2

Consider angles $\frac{-23\pi}{6}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-23\pi}{6}\right)$ and $\cos\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).





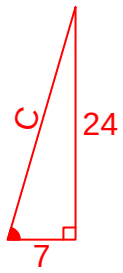
$\sin(-23\pi/6) = \frac{1}{2}$

$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{24}{7}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

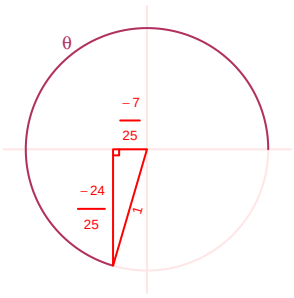
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-7}{25}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.27 meters, a frequency of 8.97 Hz, and a midline at $y = -3.5$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.27\cos(2\pi 8.97t) - 3.5$$

or

$$y = 5.27\cos(17.94\pi t) - 3.5$$

or

$$y = 5.27\cos(56.36t) - 3.5$$